

UNIVERSITY OF ALBERTA LIBRARY

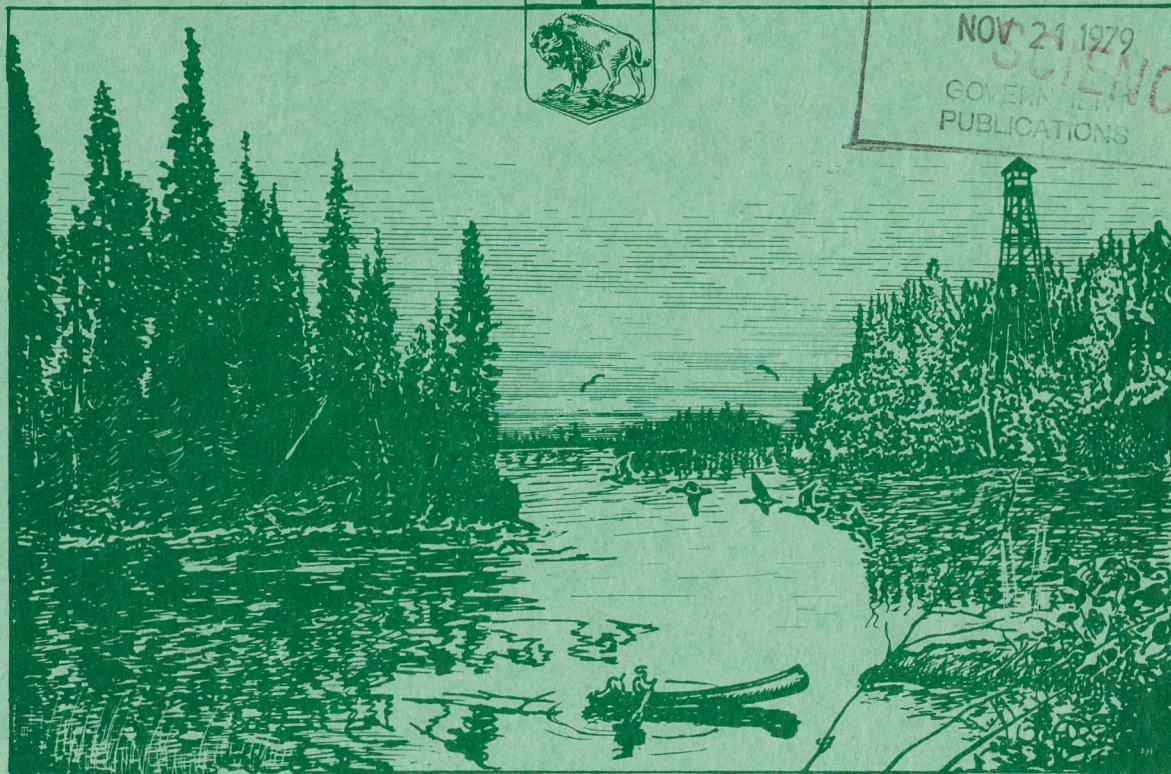


0 0001 3776 158

Report No. 8

SOUTHWESTERN FOREST SECTION

And the uncruised portion of the Accessible Area of Manitoba



# Forest Resources Inventory

—1956—

SD  
146  
M3  
M27  
1956  
no.8

SCI



ONE YEAR LOAN

FOREST SERVICE

Department of Mines and Natural Resources  
PROVINCE OF MANITOBA

Winnipeg, 1960



Ex libris  
UNIVERSITATIS  
ALBERTAENSIS



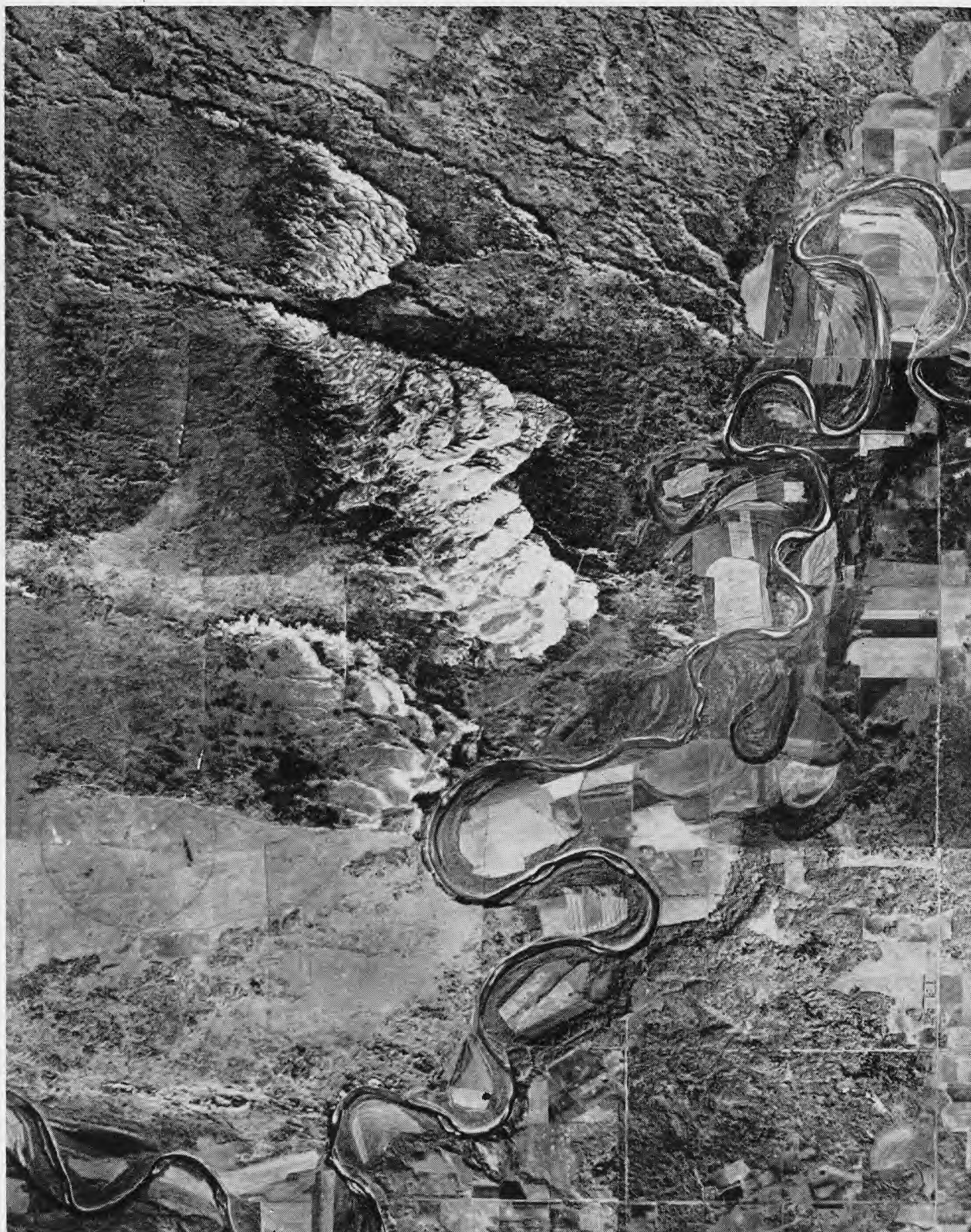
# *Forest Resources Inventory* *1956*

Report No. 8

**SOUTHWESTERN FOREST SECTION**  
and the uncruised portion of the Accessible Area  
of Manitoba



**FOREST SERVICE**  
Department of Mines and Natural Resources  
**PROVINCE OF MANITOBA**  
Winnipeg, 1960



*Mosaic map made from aerial photographs showing sand dunes in Spruce Woods area, also encroaching on the Assiniboine Valley; scale 1 inch to 1 mile.*



# Preface

This is one of a series of bulletins summarizing the results of the ground and aerial survey work which was completed in 1956 in connection with the latest Forest Inventory of Manitoba. The figures in this new series will replace those previously used based on surveys made between 1927 and 1930, and tabulated in "The Forests of Manitoba, Bulletin 85," published by the Dominion Forest Service in 1934.

For the purpose of the new Forest Inventory the Province has been divided (as shown on Map 1) into four zones based on climate, original vegetation, and predicted future use, as follows:

Agricultural Forest	Transition from Forest to Tundra Tundra or Barren Lands
------------------------	--

The Forest Zone may be defined as the area which is producing or is capable of producing forest crops and which for climatic reasons is, in the main, more suitable for the production of wood than for agricultural crops. The Forest Zone has an over-all area (omitting the three major lakes—Winnipeg, Manitoba and Winnipegosis) of about 113,000 square miles or nearly half the total area of Manitoba (less these lakes).

Based on the presence or absence of transportation routes such as railways, highways and water routes, the Forest Zone is again divided into an Accessible and Inaccessible Area.

The Accessible Forest Zone with an over-all area of about 64,000 square miles has been divided for Inventory purposes into eight Forest Sections based on physical geography and administrative boundaries, as follows:

Southeastern Winnipeg River Lowlands South Mountain	Lowlands North Nelson River Northern Mining Southwestern
--	---

Each of the Forest Sections is again divided into Working Circles which conform with Forest Ranger Districts, except in the more northerly areas where on account of their large size it has been necessary to subdivide the Ranger Districts.

The Inaccessible Forest with an over-all area of about 49,000 square miles has been divided into 20 Inventory Units.

Although a limited amount of the Forest Zone was inventoried before 1951, the main work was done commencing April 1st, 1951, from which date the Federal Government has reimbursed to the Province one-half of the expenditures incurred in forest resources inventory under the terms of an agreement with the Province pursuant to the provisions of the Canada Forestry Act.

A separate report will be published for each of the eight Forest Sections of the Accessible Area. The whole of the Inaccessible Forest will be covered by an additional report.



# Contents

	Page		Page
PREFACE .....	3	Early History .....	20
FOREST RESOURCES INVENTORY .....	8	Development of the Area .....	23
General .....	8	Forest Administration .....	25
Geology and Topography .....	10	Forest Inventory .....	27
Climate, Soil, and Natural Vegetation .....	12	Forest Utilization .....	27
(1) Climate .....	15	Reforestation .....	30
(2) Parent Material of the Soil .....	15	Farm Forestry and Tree Culture Projects .....	31
(3) Natural Vegetation .....	16	APPENDIX .....	31
(4) Other Factors influencing Soil and Vegetation .....	20	Rotation .....	31
		Allowable Cut .....	32
		Common and Botanical Names of Tree Species mentioned in Report .....	32
		REFERENCES .....	32

## Tables

TABLE 1—Summary of Land and Water Area .....	8	TABLE 8—Softwood and Hardwood Volume by Tenure and Size Classes — Uncruised Access- ible Area .....	26
TABLE 2—Area Classification—Southwestern Forest Section .....	12	TABLE 9—Volume by Species and Size Classes — Uncruised Accessible Area .....	29
TABLE 3—Area Classification of Productive Forest by Working Circles, Cover Types, and Mer- chantability—Southwestern Forest Section .....	14	TABLE 10—Cull Factor by Species — Southwestern Forest Section .....	30
TABLE 4—Softwood and Hardwood Volume by Size Classes and Working Circles, Southwestern Forest Section .....	19	TABLE 11—Utilization of Forest Products, Average Annual Production for 5-year period 1954-55 to 1958-59—Spruce Woods and Turtle Moun- tain Forest Reserves .....	31
TABLE 5—Volume by Species and Size Classes — Southwestern Forest Section .....	21	TABLE 12—Number of Trees planted on Crown Lands in Spruce Woods and Turtle Mountain Areas .....	31
TABLE 6—Land Classification — Uncruised Access- ible Area .....	22	TABLE 13—Rotation of Species .....	31
TABLE 7—Area Classification of Productive Forest by Tenure, Cover Type, and Merchantability— Uncruised Accessible Area .....	24		

## Figures

FIG. 1—Comparison of Softwood and Hardwood Volume—Spruce Woods Subsection .....	11	FIG. 4—Merchantable Volume by Species — Spruce Woods Subsection .....	22
FIG. 2—Merchantable Softwood Volume by Subsec- tions and Size Classes .....	13	FIG. 5—Merchantable Volume by Species — Turtle Mountain Subsection .....	26
FIG. 3—Merchantable Hardwood Volume by Sub- sections and Size Classes .....	18		



## *Illustrations*

ILLUS. 1—Mosaic map made from aerial photographs showing sand dunes in Spruce Woods Area, also encroaching on the Assiniboine Valley; scale 1 inch to 1 mile .....	2	ILLUS. 5—Barn made of local balsam poplar .....	15
ILLUS. 2—White spruce plantation, Turtle Mountain Forest Reserve, with 30 cords per acre, 46 years after planting .....	7	ILLUS. 6—Aspen poplar boxwood .....	16
ILLUS. 3—Sand dunes—Spruce Woods Forest Reserve	10	ILLUS. 7—Canada geese at Delta .....	19
ILLUS. 4—Ploughing fireguard in the early days ....	13	ILLUS. 8—Hereford cattle grazing — Spruce Woods Forest Reserve .....	23
		ILLUS. 9—Pelican Lake, a popular Southwestern Manitoba resort area .....	25
		ILLUS. 10—Planting machine in action — Spruce Woods Forest Reserve .....	28

## *Maps*

MAP No. 1—Forest Inventory Sections .....	6	MAP No. 3—Vegetation Regions — Southwestern Manitoba .....	17
MAP No. 2—Southwestern Forest Section .....	9		

### **PREPARED BY FOREST MANAGEMENT DIVISION**

W. K. Webster, Chief of Division

General supervision of Forest Inventory, text, and arrangement of report by C. B. Gill, formerly Chief of Forest Management.

Ground control and base mapping by Surveys and Mapping Branch, Department of Mines and Technical Surveys, Ottawa; and by Forest Service and Surveys Branch, Department of Mines and Natural Resources, Winnipeg.

Field inventory by C. E. Leitkie, R. Simmons, and others.

Aerial photo interpretation and forest maps by M. E. Benum and W. G. Edmonds.

Compilation (Cruised Area) by M. E. Benum, W. G. Edmonds, C. E. Leitkie, L. Pasterz, etc.

Compilation (Uncruised Area) by M. E. Benum and C. B. Gill.

Maps Nos. 1, 2, and 3 by P. J. Peloquin.

Tables Nos. 1 to 13 by C. B. Gill.

Figures Nos. 1 to 5 by L. Pasterz.

Cover design by D. R. McTavish.









—Forestry Branch—Canada

*White spruce plantation, Turtle Mountain Forest Reserve, with 30 cords per acre, 46 years after planting.*

# Forest Resources

## SOUTHWESTERN FOREST SECTION

### and the Uncruised Portion of the Accessible Area of Manitoba

#### General

The Southwestern Forest Section includes two forest areas—the Spruce Woods area and the Turtle Mountain Forest Reserve, which have been covered by inventory surveys in sufficient detail to meet the requirements of the Federal-Provincial agreement of 1951. These two forest areas are separated from the Forest Zone proper, and confined within the Agricultural Zone—see Map No. 1.

The Turtle Mountain Forest Reserve with an area of 72,512 acres is located adjacent to the North Dakota boundary, and is a forest area by virtue of its elevation and rugged terrain.

The Spruce Woods, with an area of 118,359 acres, is located below the City of Brandon, in the vicinity of the Assiniboine River. Its status as a forest area is due to its light soils and dune formation. For inventory purposes, the forest area is defined as that portion of the Spruce Woods Forest Reserve not included in the Military Reservation, plus certain Crown lands outside the Forest Reserve which are considered to be permanent forest areas, and on which considerable areas are under plantation.

The two forest reserves have considerable actual and potential values as wood producers, but perhaps have a greater value as “protection forests.” The Turtle Mountain requires a woodland, or at least a grass, cover in order to prevent soil erosion and gullyng from run-off waters, and to assist in the regulation of stream flow, containing, as it does, some of the headwaters of the Pembina and Souris

Table 1

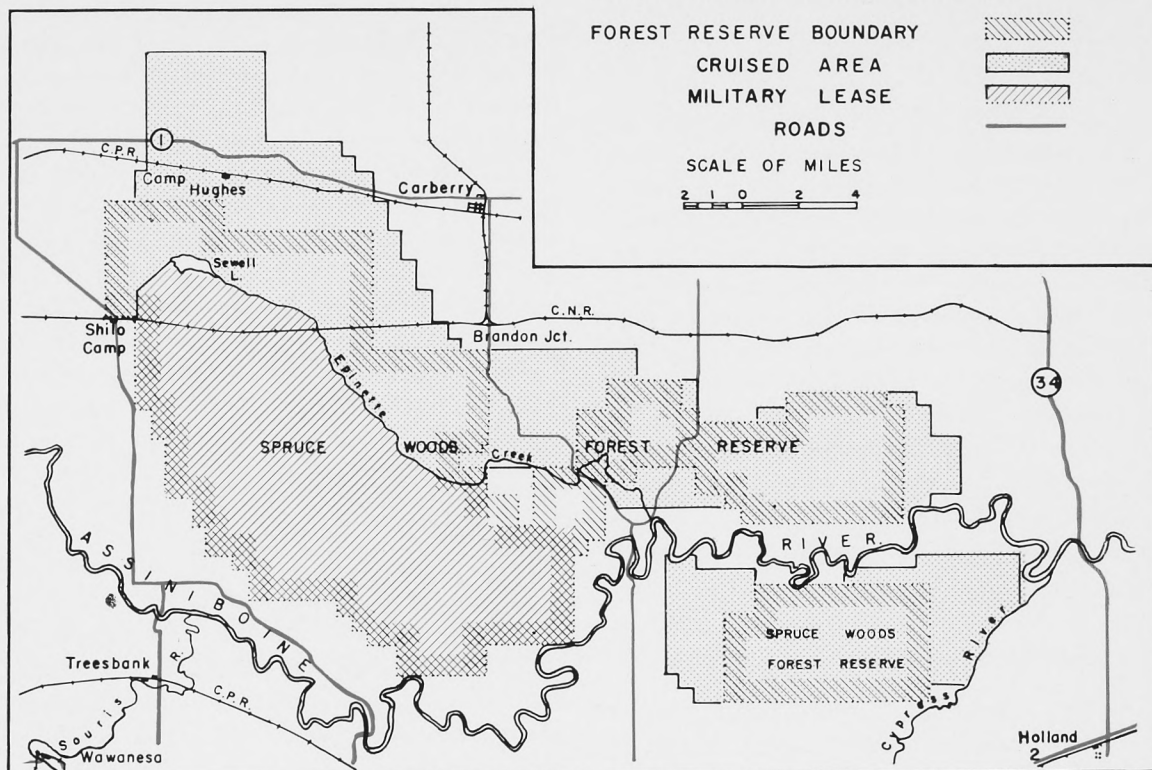
*Summary of Land and Water Area in Acres  
Southwestern Forest Section and Uncruised Accessible Area*

Description	Land Area			Water	TOTAL AREA
	Cruised	Uncruised	Total Land		
<b>1. FOREST ZONE</b>					
Spruce Woods.....	117,824	.....	117,824	535	118,359
Turtle Mountain.....	62,755	.....	62,755	9,757	72,512
Total Provincial Crown.....	180,579	.....	180,579	10,292	190,871
Indian Reserves.....	.....	280,701	280,701	.....	280,701
TOTAL.....	180,579	280,701	461,280	10,292	471,572
<b>2. AGRICULTURAL ZONE</b>					
Provincial Crown.....	.....	2,367,906	2,367,906	372,360	2,740,266
Private.....	.....	18,547,163	18,547,163	19,650	18,566,813
Indian Reserves.....	.....	158,739	158,739	.....	158,739
TOTAL.....	.....	21,073,808	21,073,808	392,010	21,465,818
<b>3. MAJOR LAKES*</b>					
Provincial Crown.....	.....	.....	.....	8,405,000	8,405,000
<b>GRAND TOTAL</b> .....	180,579	21,354,509	21,535,088	8,807,302	30,342,390
<b>PER CENT OF TOTAL LAND AND WATER AREA</b> .....	.....	.....	71.0	29.0	100.0

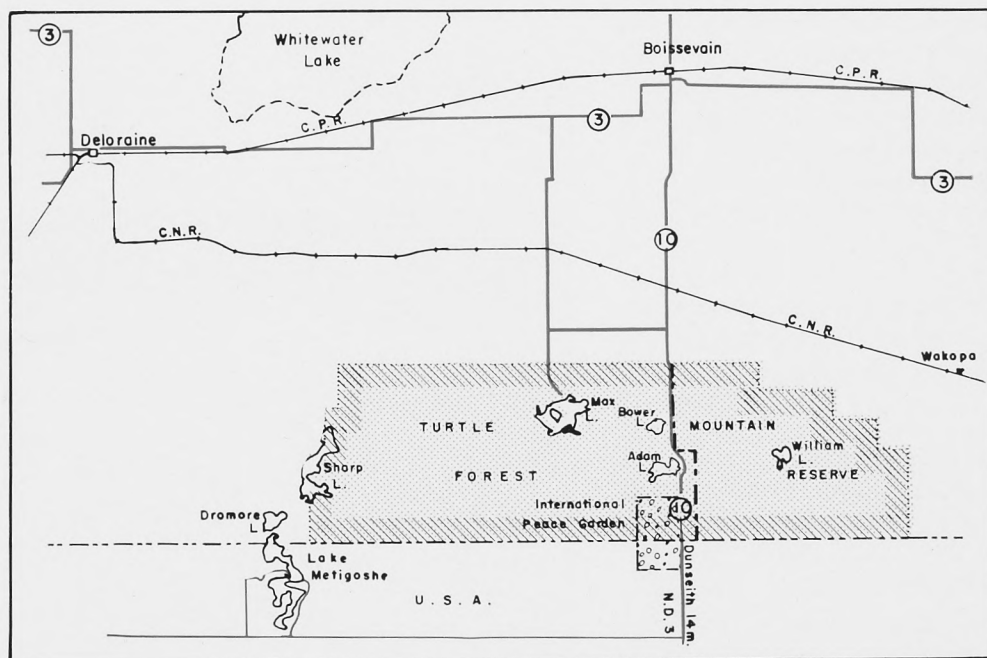
\*Lakes Winnipeg, Manitoba, and Winnipegosis only.



# SOUTHWESTERN FOREST SECTION



SPRUCE WOODS AREA



TURTLE MTN. AREA

Map No. 2

ivers. The light sandy area of the Spruce Woods is subject to "blowout" and dune formation whenever the cover of grass or forest is removed.

It has been considered expedient to include in this report a preliminary estimate covering the balance of the Accessible Area of Manitoba, not included in Inventory Reports Nos. 1 to 7. This balance includes the whole of the Agricultural Zone, as shown on Map No. 1, consisting of patented lands, Crown lands, and Indian Reserves. It also includes a preliminary estimate covering Indian Reserves in the Accessible Forest Zone as well as certain small unphotographed islands in Lake Winnipeg. In order to arrive at the total accessible area of Manitoba, it was found necessary to make a new calculation of the water area of the three major lakes—Winnipeg, Manitoba and Winnipegosis. Refer to Table 1.

### ***Geology and Topography***

Geographers divide the "Great Plains" regions of Western Canada into three prairie levels or steppes, with a fourth division, to the west, consisting of the foothills of the Rocky Mountains. Southern Manitoba includes parts of the first three levels.

The first level, often referred to as the Manitoba Lowlands — including the Red River, the lower Assiniboine valley, and the area of the three large lakes—Winnipeg, Manitoba, and Winnipegosis—is bounded on the east by the region of Precambrian rock, and on the west by the steep slopes of the Cretaceous escarpment. The whole area was covered by the waters of Lake Agassiz following the retreat of the last ice-sheet.

The second level extends from the escarpment westward and southward into Saskatchewan and North Dakota, excluding the Turtle Mountain elevation.

The third prairie level is generally considered to extend westward from the Missouri Coteau, which lies in a northwesterly and southeasterly direction across Saskatchewan and North Dakota at some distance beyond Manitoba's western boundary. However, the Turtle Mountain from both a geological and topographical point of view may be considered as an outlier of this third level.<sup>1</sup>

The first level, referred to above, is underlain by Palaeozoic rocks, mostly limestone, sloping gently to the southwest and covered to varying depths by glacial drift deposits. In the south and west the upper layers of unconsolidated material consist mainly of lacustrine deposits varying in texture from clay to sand, deposited as sediment in glacial Lake Agassiz, by the old Assiniboine and other smaller streams flowing from the higher level to the west. This area includes the rich farm lands of the Red River valley, the Portage plains, Dauphin Plains, and the Swan River valley. The western edge of the first prairie level, as it abuts on the lower slopes of the Cretaceous escarpment, is marked by a series of sand and gravel ridges which are the remnants of beaches formed at various levels by glacial Lake Agassiz as its waters were lowered periodically with the formation of new outlets to the east. The various lacustrine deposits are mainly underlain by unmodified glacial till lying on the bedrock. Further north and east, in the Interlake and West-Lake areas, the lacustrine deposits are usually found only in inland depressions and around the southern end of the bays of the major lakes; on the higher areas, high-lime glacial till is found at the surface, usually much modified by wave action, the finer particles having been sorted out and washed into the lower areas, and in



—C. C. Crieih, Carberry

*Sand dunes—Spruce Woods Forest Reserve.*



a few places the limestone bedrock has been exposed.

The second level is underlain by Cretaceous rock, mainly shale, which is seldom exposed at the surface, being for the most part covered to a considerable depth by glacial drift material. Long before the glacial age this shale rock was deeply eroded by rivers flowing from the west. Some of these rivers were able to return to their old channels after the advance and retreat of the continental ice-sheet, while in other cases new channels were formed after the old channel had been blocked by the glacial ice. The upper Assiniboine and its tributaries, the Shell, Birdtail, and Minnedosa Rivers, have wide and deep valleys, also the Souris and the Pembina Rivers. The Assiniboine at one time received the waters of the South Saskatchewan, through the present Qu'Appelle valley. The Souris, which was in earlier times continuous with the Pembina, may have received drainage from the upper Missouri in pre-glacial time.<sup>2</sup> The elevated blocks of the Riding and Duck mountains are separated by a wide and ancient valley now occupied by a number of small streams. Further north the Duck and Porcupine mountains are separated by a similar valley now drained by the Swan and Woody Rivers.

As a result of long continued erosion, much of southwestern Manitoba probably developed a topography of buttes and mesas, somewhat similar to what we now see in the unglaciated regions of western North Dakota. This rugged surface was partially evened out by the advancing ice-sheet, which, on its retreat, left a mantle of drift material over most of the area, so that much of the present surface of the second level may be described as undulating to rolling, with occasional rounded hills. Remnants of the ancient topography may still be found along the slopes of the escarpment and as smoothed out knobs in the Pembina and Tiger Hills region.

Between the higher elevation of the Riding Mountain to the north and Pembina Hills, Tiger Hills, and Turtle Mountain to the south, is a broad, relatively flat, area which extends westward along the Assiniboine to Virden and southwestward along the Souris River to Melita and beyond. In this area the blocking of ancient drainage channels by the ice-front resulted in the formation of a number of temporary lakes in whose beds lacustrine materials were deposited by rivers flowing from the ice-sheet which lay to the west and north. The waning ice-front appears to have been divided into lobes as a result of splitting by pre-existing prominences in the Riding Mountain, Brandon Hills, Tiger Hills, and Pembina Mountain. Subsequently, parts of the front retreated to the northwest and parts to the northeast. Lakes were formed in order, first at the foot of the Turtle Mountain, south of Goodlands, and in the Whitewater area, later in the vicinity of Souris and Carroll, and still later south of Holland and Glenboro, and in the vicinity of Brandon and Harding. The boundaries of these lakes fluctuated as new outlets were opened up, but at one time or another most of the country east and south of a line drawn from Lyleton through Pipestone to Virden and Rivers was under lake waters. These lakes were confined on their eastern margin at first by a glacier lobe, and later, in part by the higher land to the east in the Turtle Mountain, Brandon Hills, Tiger Hills, and Pembina Mountain region. As the ice-front retreated to the northeastward, the area under lake moved in the same direction and the southwesterly areas dried up, or, to use the names coined by early geologists, Lake Souris was followed by Lake Brandon, and Lake Brandon by Lake Agassiz.

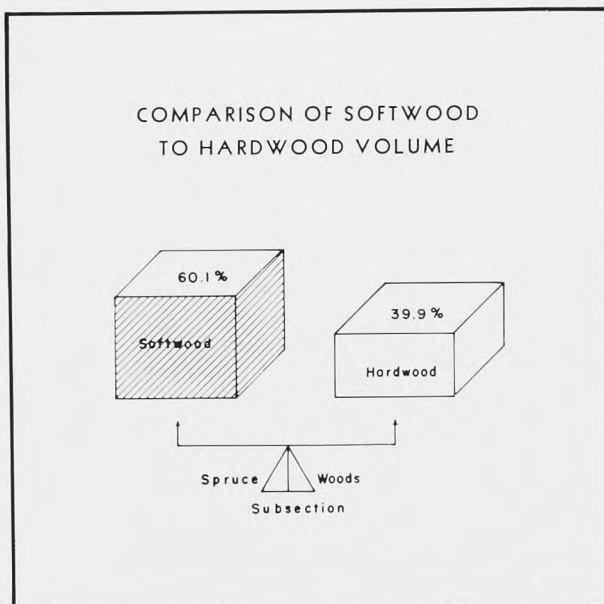


Figure 1.

Into this series of lakes, rivers enlarged by the melting of glacial ice, deposited sediments—coarser material, mainly sand, near their mouths, and finer material in the quieter and deeper parts. As a result, the present land surface is level to gently undulating except where the sands were later moved by winds to form dunes. These sandy, duned areas are conspicuous south of Oak Lake where the upper Assiniboine formed a delta, in the Lauder area where the upper Souris entered the lake, and most conspicuous where the Assiniboine entered Lake Agassiz in the Carberry area.

The Turtle Mountain, or third level, is a conspicuous topographic feature as viewed from the north, rising as it does to elevations of over 2,400 feet above sea level, or about 900 feet above the plain. This area is underlain by the youngest of Manitoba rock—the Boissevain and Turtle Mountain formations. The rock consists of sandstone, shale, and some lignite coal, and is related to the coal-bearing rocks found further west near Estevan, Saskatchewan. Boissevain sandstone has been used to some extent as a building material. Most of the rock is deeply buried by glacial material deposited

as an end moraine. The surface is very irregular, being dotted with lakes and swampy depressions. This condition is brought out in the area classification figures in Table 1 and 2 which show that 13.5% of the Turtle Mountain Forest Reserve is water and 7.2% nonforested, (swamp, in this case). The lakes range in size from Lake Max, about 740 acres, to quite small potholes.

### *Climate, Soil and Natural Vegetation*

Climate, soil, and natural vegetation are so intimately related that it is convenient to discuss them together. Briefly stated, climate determines the broad vegetation pattern, while vegetation and ground-up rock, or parent material, make the soil.

The inter-relationship of the three factors—climate, vegetation, and soil, has been well expressed by Professor J. H. Ellis, formerly head of the Soils Division of the University of Manitoba, as follows:

“The establishment of the native vegetation, under virgin conditions prior to settlement in western Canada, was not the result of chance

**Table 2** *Area Classification in Acres—Southwestern Forest Section*

Working Circles	*Productive Forest			Potentially Productive Forest †	Non- productive Forest #	Permanently Nonforested Land ‡	TOTAL LAND
	Unmerchantable	Merchantable	SUBTOTAL				
SPRUCE WOODS							
Camp Hughes.....	9,187	16,212	25,399	2,689	4,140	7,942	40,170
East Block.....	6,679	20,413	27,092	3,885	.....	5,893	36,870
Brandon Junction.....	1,776	5,480	7,256	1,277	519	357	9,409
South Block.....	9,677	20,323	30,000	390	.....	985	31,375
TOTAL.....	27,319	62,428	89,747	8,241	4,659	15,177	117,824
PERCENTAGE.....	23.2	53.0	76.2	7.0	3.9	12.9	100.0
TURTLE MOUNTAIN							
East.....	11	21,766	21,777	.....	.....	1,157	22,934
Centre.....	71	19,445	19,516	.....	.....	1,645	21,161
West.....	.....	16,222	16,222	.....	.....	2,438	18,660
TOTAL.....	82	57,433	57,515	.....	.....	5,240	62,755
PERCENTAGE.....	0.2	91.5	91.7	.....	.....	8.3	100.0
GRAND TOTAL.....	27,401	119,861	147,262	8,241	4,659	20,417	180,579
PERCENTAGE.....	15.2	66.3	81.5	4.6	2.6	11.3	100.0

\*Land supporting merchantable timber or young growth which will produce merchantable timber within a reasonable time.

†Cut-over, burn, brush or grassland, not now supporting productive forest, but capable of doing so.

#Land with a forest cover such as treed muskeg, treed rock, and willow or alder swamp, but incapable of producing a forest crop of merchantable size within a reasonable time.

‡Includes marsh, muskeg, rock, meadow, developed agricultural land, urban areas, roads and railroads. In general, lands not expected to produce forest of any kind.



# MERCHANTABLE SOFTWOOD VOLUME BY SUBSECTIONS AND SIZE CLASSES

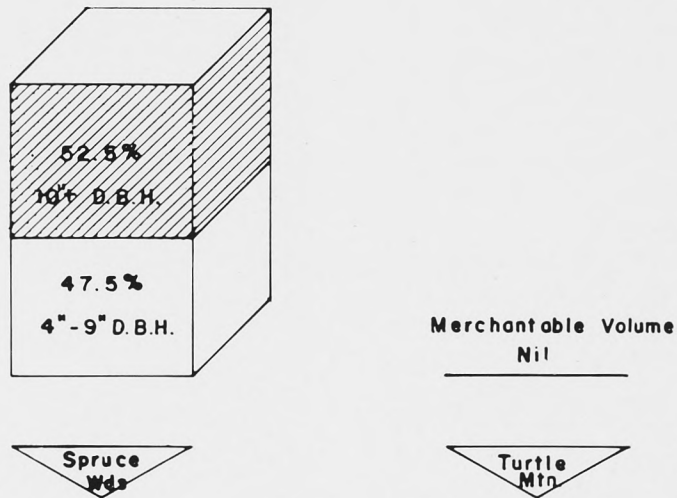


Figure 2.



*Ploughing fireguard in the early days.*

Table 3

*Area Classification of Productive Forest by Working Circles, Cover Types, and  
Merchantability—Southwestern Forest Section*

Working Circle	COVER TYPES IN ACRES							
	Softwood		Mixedwood		Hardwood		TOTAL	
	Unmerch.	Merch.	Unmerch.	Merch.	Unmerch.	Merch.	Unmerch.	Merch.
SPRUCE WOODS SUBSECTION								
Camp Hughes.....	6,569	8,062	2,323	6,969	295	1,181	9,187	16,212
East Block.....	37	55	6,208	18,624	434	1,734	6,679	20,413
Brandon Junction.....	614	921	92	278	1,070	4,281	1,776	5,480
South Block.....	6,032	9,048	3,305	9,915	340	1,360	9,677	20,323
SUBTOTAL.....	13,252	18,086	11,928	35,786	2,139	8,556	27,319	62,428
TOTAL.....	31,338		47,714		10,695		89,747	
TURTLE MOUNTAIN SUBSECTION								
East.....	11	-----	-----	-----	-----	21,766	11	21,766
Centre.....	71	-----	-----	-----	-----	19,445	71	19,445
West.....	-----	-----	-----	-----	-----	16,222	-----	16,222
SUBTOTAL.....	82	-----	-----	-----	-----	57,433	82	57,433
TOTAL.....	82		-----		57,433		57,515	
WHOLE SOUTHWESTERN FOREST SECTION								
TOTAL.....	13,334	18,086	11,928	35,786	2,139	65,989	27,401	119,861
GRAND TOTAL	31,420		47,714		68,128		147,262	

occurrence, but of the suitability of the occurring plant species to the existing environment. Thus the presence of forest vegetation in one region, and of open grassland in another, was Nature's evidence of the long-time harmonious adjustment between the vegetation, the soils, and the climate . . . ."

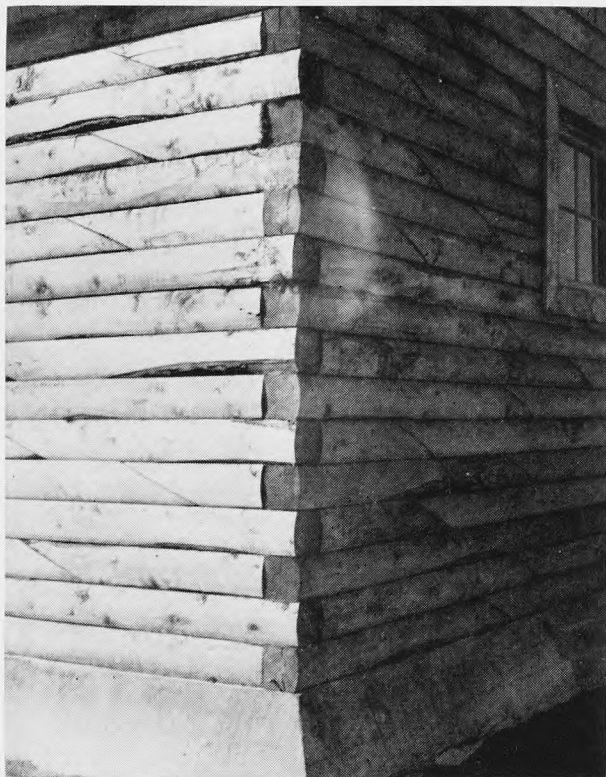
"In the final analysis the most important factor in the distribution of vegetation is climate, either as it affects plants directly, or as it affects and determines the soil type."<sup>3</sup>

Soil zone and vegetation zone maps of Manitoba are in close agreement and both show a general transition from southwest to northeast in agreement with the climate. To make the picture clearer, it might be well to mention first, the short-grass plains, which coincide with the brown soil zone

found in southwestern Saskatchewan. This zone is followed by the mixed short grass and tall grass prairie, corresponding to the dark brown soil zone, found as a belt across Saskatchewan, northeast of the brown soil zone, and also occurring as the Was-kada, Whitewater and Bede soils in southwestern Manitoba in the locations indicated by the soil names. Further north and east, in Manitoba the tall grass prairie or black earth soil zone is found, stretching across the province from the Red River valley to Elkhorn. The next zone is a transition from grassland to forest and is often described as the Aspen Grove Belt from the fact that islands or "bluffs" of aspen poplar occur throughout the tall grass prairie. Soil scientists have labelled it Northern Black Earth or Degrading Black Earth, the term "degrading" referring to the fact that the soil profile indicates an advance of tree growth



onto what was formerly grassland. Beyond the Aspen Grove Belt we have the Mixed Wood and the Coniferous Forest belts, with Grey Wooded and Podzolic soils respectively—see Forest Inventory reports Nos. 1-7.



*Barn made of local balsam poplar.*

### (1) *Climate*

Weather observations have been recorded at Winnipeg since 1874, at Minnedosa since 1890, and at numerous other points for shorter periods, with the result that meteorological information is much more complete in the prairie and aspen grove region of Manitoba than it is further north in forest regions. For the agricultural zone and including the Spruce Woods region the precipitation varies from 15 to 21 inches annually, being least in the southwestern prairie and greatest in the Interlake and Red River regions. Snowfall is comparatively light, as only about 20 to 25 per cent of the precipitation falls in the form of snow. The peak of the rainy season occurs on the average towards the end of June.

The average mean daily maximum temperature for July ranges from 75° to 82° Fahrenheit, while the average mean daily minimum for January is from 9° to 14° below zero.

The average length of the period free from killing frost, taken at 29.5°, is from 110 to 140 days, and the frost free period, using 32°, varies from 80 to 115 days in the year.

The forest vegetation found on the Turtle Mountain as compared with the grassland on the plain below appears to indicate a moister and, perhaps, a cooler climate on the upper levels. No long term weather records exist for the Turtle Mountain, but records were kept for four years in the 1880's, which in comparison with the record made in the same years at points on the plain below show precipitation on the mountain as nearly 50 per cent greater, while the growing season is known to be shorter.

### (2) *Parent Material of the Soil*

All the inorganic parent material in the soils of Manitoba is directly or indirectly of glacial origin, or, to use the usual geological term, consists of drift. The drift may be divided into two broad classes depending on whether it remained unmodified, after being deposited by the melting of glacial ice, or whether it was later modified by the sorting action of water or wind.

The unmodified drift usually referred to as till or boulder till consists of rock particles of all sizes from the finest clay to quite large boulders. Two classes of unmodified drift are conspicuous in Manitoba and elsewhere in glaciated regions. The first is named ground moraine, referring to the fact that it was deposited on the ground as the ice-sheet became stagnant and gradually melted away leaving the imbedded soil material to form what is usually an undulating or rolling surface. Much of the country lying above the level of the old glacial lakes has this type of land form. A second type of till deposit known as end moraine occurs where a margin of the ice-sheet remained stationary for a considerable period of time, the rate of ice advance being in balance with the rate of melting at the front. In this case the soil material was deposited at the ice margin in the form of irregular ridges, with many knobs and kettles; boulders are apt to be

prominent due to the washing away of part of the finer soil material. Examples of this land form are to be found in the Turtle Mountain, in the elevated region south of the Assiniboine River between Brandon and Treherne, around Rapid City, north of Douglas, and as a belt south of the Riding Mountain National Park.

Modified drift may be divided into a number of classes. Lake deposits are usually well sorted and range from fine clay to sand. When a river enters a quiet lake, the coarser sediments are dropped first and a sandy delta may be formed, as was the case in the Spruce Woods region when the Old Assiniboine River entered glacial Lake Agassiz. In this case the retreat of the lake left a sandy surface exposed to wind action and the resultant formation of dunes which are such a prominent feature of the area at the present time. Beach deposits occur as low sand and gravel ridges, along the margins of ancient lakes, and now often furnish good highway locations. Streams of water from the ice-sheet often carried coarse sand and gravel beyond the ice margin and left it spread out as a level to undulating outwash deposit. Examples of this land form are to be found west of Lazare, west of the Spruce Woods Forest Reserve, around Rivers, north of Rock Lake, at Birds Hill, and elsewhere.<sup>2</sup>

The different types of geological material outlined above have been modified by climate agencies and by vegetation to produce soils which may differ greatly from the parent material which makes up the greater part of their content.

### (3) *Natural Vegetation*

Map No. 3 shows the Vegetation Regions of southern Manitoba, the various areas being numbered from 1 to 7.

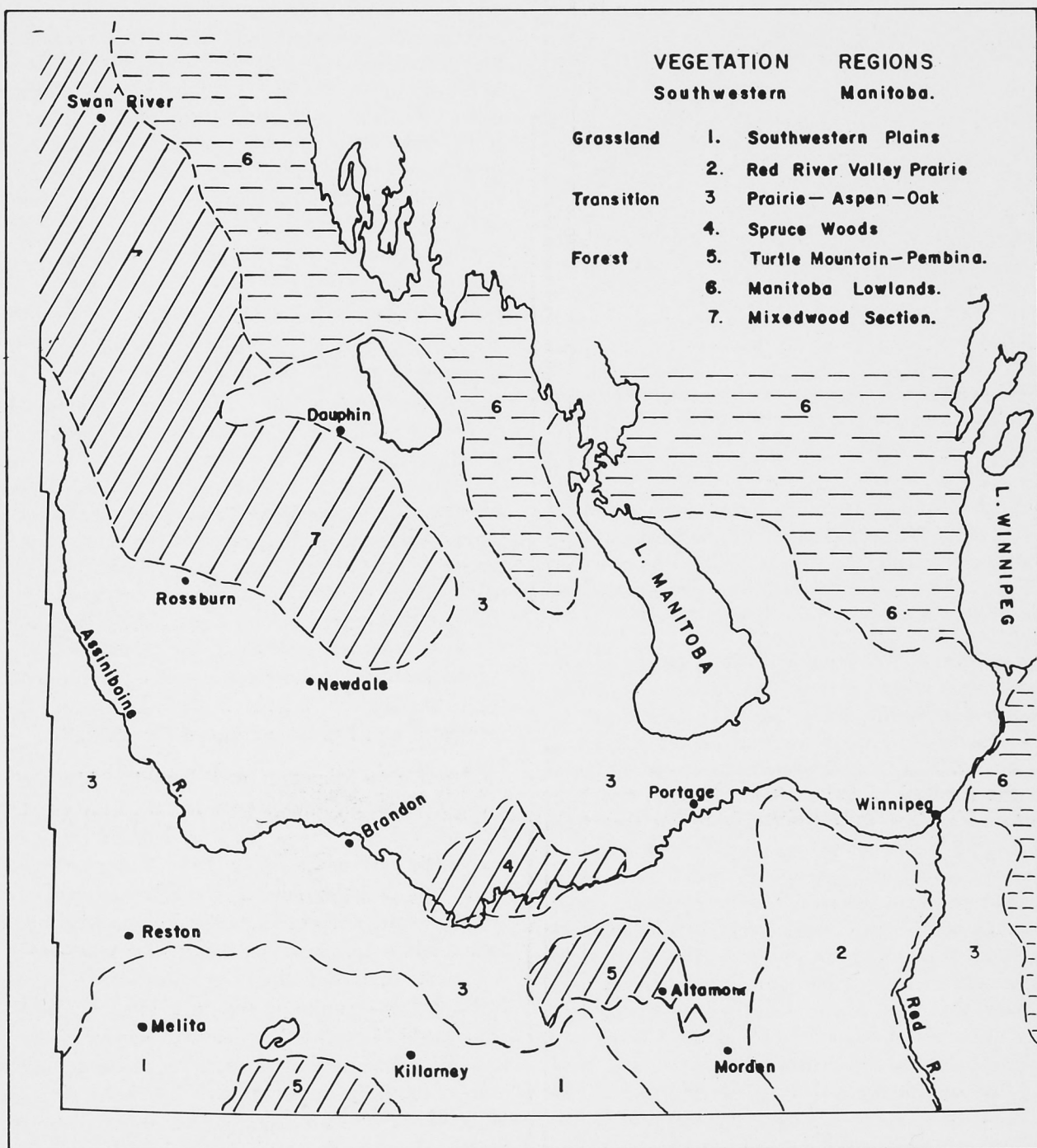
The Southwestern Grassland, No. 1, forms part of the mixed prairie which extends into Saskatchewan and North Dakota. The native vegetation is dominantly a mixture of tall and short species of grass. Trees and shrubs are found only in the less exposed positions. The region is mainly in the Dark Brown Soil Zone which is a transition zone between the dryer Brown Soil Zone to the southwest and the moister Black Soil Zone to the north and east.<sup>4</sup>

In the Red River Valley Prairie (No. 2 on vegetation map) tall grasses are dominant, especially those which thrive best in moist localities, and sedges are prominent in the undrained depressions. A fringe of woods is usually found along streams, bur oak and aspen on the higher well drained banks, with elm, cottonwood, Manitoba maple, green ash, and basswood on the river lowlands, subject to periodic flooding. The Red River valley forms part of the Black Earth Soil Zone.

The Prairie-Aspen-Oak region, or Aspen Grove Belt (No. 3 on vegetation map) which occupies a large proportion of southern Manitoba is a transition belt between the grassland and forest formations. Groves or "bluffs" of trees increase in size towards the north and east until they become more or less continuous. Aspen is the dominant species; balsam poplar occurs in slightly moister locations, and bur oak on dryer sites; conifers are absent. The



*Aspen poplar boxwood.*



Map No. 3



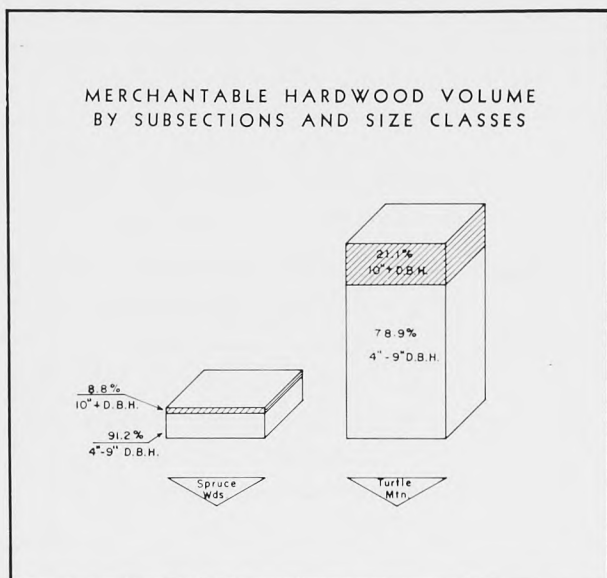


Figure 3.

transition from grassland to forest shows up in the soil profile of this region. While the grasslands are true black earths, the groves of trees have locally influenced the soils on which they grow to such an extent that it may be termed grey-black.<sup>7</sup>

The Spruce Woods region (No. 4 on the vegetation map), is set off from the surrounding Aspen-Oak region by the sandy nature of its soil and by the presence of ground water at depths of from 12 to 20 feet. This ground water is an important factor in the survival of vegetation. Although the light textured surface soils are droughty, so that trees and other perennial plants may have difficulty in getting established, except in wet years or in shaded positions, the roots tend to penetrate downward to permanently moist levels, after which their survival is assured. Soil pits excavated to a depth of seven feet in the Shilo and Camp Hughes area, showed that most of the plants, native to the area, and also the introduced jack pine and Scots pine had developed strong roots to below this level. Species specifically noted as penetrating to this depth and beyond were jack pine, Scots pine, aspen, wild rose, sand cherry, choke cherry, snowberry and horsetail (*Equisetum*). Indications were that white spruce, creeping juniper, and the perennial grasses, sedges, and herbs also reached down to the permanently moist level.

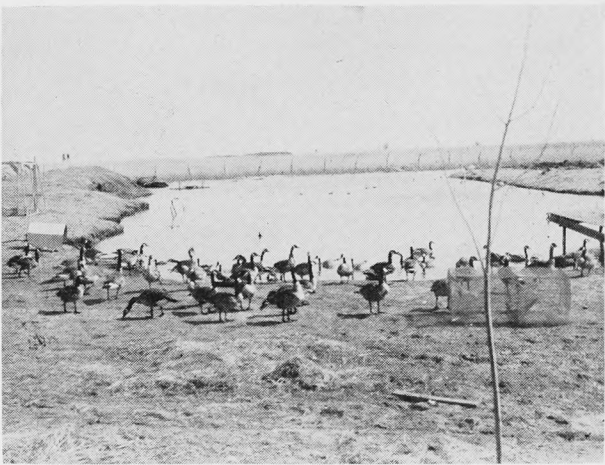
Much of the Spruce Woods area was at an earlier time influenced by wind, as is indicated by the dune formations, now generally grassed over or forested. Excavations show that there have been several cycles of wind erosion and turf formation, the dry periods showing as yellowish-brown and indicating that the soil was drifting, while the moist periods are indicated by buried dark coloured layers containing organic matter. At the present time there are no active dunes except for an area of several square miles located on the north bank of the Assiniboine River, north of Glenboro, and a smaller area south of Onah. Any disturbance of the soil by breaking the soil for cultivation or even by heavy grazing, however, is apt to start soil drifting.

The vegetation of the Spruce Woods area has been referred to in "The Flora of Manitoba" as, "a remarkable relic colony of scattered individuals and small groups of white spruce, associated with creeping juniper . . . in a sandy area of otherwise almost pure prairie vegetation."<sup>5</sup> The 1953 forest survey of the Spruce Woods area gave over half the timber volume to white spruce (56 per cent). Aspen poplar amounted to 29 per cent, followed by bur oak, balsam poplar, black spruce, tamarack, and birch, in that order. Jack pine and balsam fir, which are prominent components of the mixedwood and coniferous forest to the north, are completely absent from the Spruce Woods area, except that the former species has been successfully planted.

The Turtle Mountain and Pembina Mountain areas together make up region No. 5 on the vegetation map. These two areas due to their elevation above the surrounding plain have cooler temperatures and probably higher precipitation than the region below, and consequently, the natural vegetation is tree growth rather than grass. Aspen is the dominant tree, but there is considerable white birch, balsam poplar, green ash, bur oak, white elm, and Manitoba maple. No conifers occur naturally. The Pembina area has long been settled and most of the forest growth has been cleared, while the Turtle Mountain or at least the central portion, has remained as Crown land so that the original natural vegetation remains relatively undisturbed. In both areas the forest cover has influenced the soil profile so as to produce a degrading black earth, or, in places, a grey-wooded soil.<sup>6</sup>

The forest survey of the Turtle Mountain Forest Reserve carried out in 1953 showed that 92 per cent of the total land area was wooded, although much of the area was poorly stocked, especially the eastern portion. The poorly stocked area includes much low lying area with a willow cover, and also higher land with a cover of bur oak and shrub species other than willow. That the Turtle Mountain is capable of very good timber production was brought out in the records of wood removed from clear cut areas in the 1930s. One of the better areas, where the stand was less than 40 years old, produced 50 cords per acre of good quality aspen poplar.

The area between lakes Winnipeg and Manitoba, the area west of Lake Manitoba, and an area east of the Red River, taken together make up a region of high lime till and lacustrine soils, much modified by wave action, with numerous remnants of ancient lake beaches, see Manitoba Lowlands, No. 6 on the vegetation map. The region was generally wooded



Canada geese at Delta.

when settlement first came in. All the main species of the Boreal Forest, white and black spruce, aspen and balsam poplar, white birch, jack pine, balsam fir, and tamarack are present, while there is an

**Table 4**  
*Softwood and Hardwood Volume by Size Classes and Working Circles*  
*Southwestern Forest Section*

Working Circles	†VOLUME IN CUNITS (100 cu. ft. Units)								
	Softwood			Hardwood			TOTAL		
	4'' - 9'' D.B.H.*	10'' + D.B.H.*	Total	4'' - 9'' D.B.H.*	10'' + D.B.H.*	Total	4'' - 9'' D.B.H.*	10'' + D.B.H.*	Total
SPRUCE WOODS									
Camp Hughes.....	4,118	4,182	8,300	8,536	561	9,097	12,654	4,743	17,397
East Block.....	8,370	9,147	17,517	7,020	801	7,821	15,390	9,948	25,338
Brandon Junction.....	609	839	1,448	3,148	118	3,266	3,757	957	4,714
South Block.....	6,536	7,538	14,074	6,331	932	7,263	12,867	8,470	21,337
TOTAL.....	19,633	21,706	41,339	25,035	2,412	27,447	44,668	24,118	68,786
PER CENT.....	47.5	52.5	100.0	91.2	8.8	100.0	64.9	35.1	100.0
TURTLE MOUNTAIN									
East.....	.....	.....	.....	49,506	19,127	68,633	49,506	19,127	68,633
Centre.....	.....	.....	.....	53,705	6,309	60,014	53,705	6,309	60,014
West.....	.....	.....	.....	53,697	16,625	70,322	53,697	16,625	70,322
TOTAL.....	.....	.....	.....	156,908	42,061	198,969	156,908	42,061	198,969
PER CENT.....	.....	.....	.....	78.9	21.1	100.0	78.9	21.1	100.0
GRAND TOTAL.....	19,633	21,706	41,339	181,943	44,473	226,416	201,576	66,179	267,755
PER CENT.....	47.5	52.5	100.0	80.4	19.6	100.0	75.3	24.7	100.0

†Net roundwood volume: stump height 1', top diameter 3''; one stacked cord equals approximately 85 cu. ft. of wood.  
\*D.B.H. is an abbreviation for diameter at breast-height; trees are measured, outside the bark, at 4½ ft. above the ground.

isolated occurrence of white cedar at Birds Hill, northeast of Winnipeg. White elm, bur oak, green ash, and Manitoba maple occur locally.

The Mixedwood section, No. 7 on the vegetation map, has already been covered as far as its central Crown lands area is concerned in the description of the Riding Mountain National Park and the two provincial forest reserves, Duck Mountain and Porcupine, see Forest Inventory Report No. 4, Mountain Forest Section. The forest vegetation is very similar to that of the Manitoba Lowlands Section.

The southern boundaries of these last two vegetation regions, the Manitoba Lowlands, and Mixedwood, are of special interest because they agree approximately with the southern limits of coniferous tree species (except for the outlying Spruce Woods area). Depending on local conditions of soil and drainage, one or other of the three species, white spruce, black spruce, or tamarack, will usually be found furthest out in the grassland. Occasionally, on sandy ridges, jack pine reaches the outer limit, but the balsam fir margin is usually at some distance back to the north.

#### *(4) Other Factors Influencing Soil and Vegetation*

Other factors which influence the vegetation pattern are position in relation to topography and drainage.<sup>4</sup> Soil characteristics also change with age, but since our soils are all relatively young, the factor is of less importance here than it is in unglaciated areas.

The six factors controlling soil formation, outlined above, namely, parent material, climate, vegetation, relief, drainage, and age, may be considered as primary agencies. In areas which have been developed by agriculture, as is the case in most of the area under discussion here, there is a seventh factor, culture, which although it may be considered as secondary, is nevertheless very important. Breaking of prairie soil, clearing of forest, drainage of low lying areas, etc., has made great changes in the soil forming processes.

Soils may be improved by cultivation but the disturbance of natural conditions resulting from cultivation is more apt to be harmful. This fact is becoming more apparent as time passes; soil drifting by wind, and soil erosion by water, have to be combatted by one means or another. Agricultural

authorities and farmers themselves are becoming increasingly aware of this situation and much is being done to restore soils which have been damaged. The restoration of at least part of the original, natural vegetation, in the form of field shelterbelts and grassed over areas, seems to be called for in many of the cultivated areas.

#### ***Early History***

The earliest Indians occupying the prairie and parkland of south central and southwestern Manitoba, as far as certain records go, appear to have been the Assiniboines, a branch of the Sioux. They are thought to have moved west from the Lake of the Woods region about the year 1700. Many of the place names of southern Manitoba came from their language, which is evidence that they occupied the area for a considerable time, and were in contact with the first white men. The Assiniboines, although of an entirely different race and speaking a different language, were allies of the Crees and the Ojibwas, and on account of this alliance were able to share in the trade with the fur companies on Hudson Bay, and later with the Montreal companies. The early possession of firearms procured from the fur traders and of horses which were obtained from the south about the same time gave them an advantage in the buffalo hunt and also in warfare with western tribes, particularly the Blackfeet with whom they often engaged in battle. They appear to have followed the diminishing buffalo herds to the westward, until they were finally settled in Saskatchewan, Alberta, and Montana. The territory which they evacuated was taken over by the Ojibwa, Cree, and Sioux. The Ojibwa reached the Red River from the east about the year 1800, the Cree came from the north, while the Sioux were refugees from Dakota territory to the south. All the different bands were settled on reserves by 1874 when Indian Treaty No. 4 was signed.

The first men of the white race to see southwestern Manitoba were members of Pierre la Verendrye's expedition who were seeking "the western sea" and financing the exploration from the proceeds of the fur trade. Fort la Reine was established in 1738 on the Assiniboine River near Portage la Prairie, and this post became the headquarters for expeditions to the north and south. In the fall of 1738 on a trip from Fort la Reine to the Mandan



Table 5

## Volume by Species and Size Classes—Southwestern Forest Section

Species	*VOLUME IN CUNITS (100 cu. ft. Units of Wood)						†SAW TIMBER 10'' and over
	Total		4'' - 9'' D.B.H.		10'' + D.B.H.		
	<i>volume</i>	<i>%</i>	<i>volume</i>	<i>%</i>	<i>volume</i>	<i>%</i>	<i>M ft. b.m.</i>
SPRUCE WOODS SUBSECTION							
White spruce.....	38,356	55.8	17,420	39.0	20,936	86.8	9,421
Black spruce.....	1,972	2.9	1,425	3.2	547	2.3	246
Tamarack.....	1,011	1.4	788	1.8	223	0.9	101
TOTAL SOFTWOOD.....	41,339	60.1	19,633	44.0	21,706	90.0	9,768
Aspen poplar.....	19,882	23.9	18,130	40.5	1,752	7.3	788
Balsam poplar.....	2,205	3.3	2,097	4.7	198	0.8	89
White birch.....	868	1.3	743	1.7	120	0.5	54
Bur oak.....	4,254	6.2	3,912	8.3	342	1.4	154
White elm.....	45	0.1	45	0.1	-----	-----	-----
Manitoba maple.....	21	0.0	21	0.0	-----	-----	-----
Green ash.....	82	0.1	82	0.2	-----	-----	-----
TOTAL HARDWOOD.....	27,447	39.9	25,035	56.0	2,412	10.0	1,085
TOTAL ALL SPECIES.....	68,786	100.0	44,668	100.0	24,118	100.0	10,853
TURTLE MOUNTAIN SUBSECTION							
Aspen poplar.....	135,542	68.1	104,744	66.8	30,798	73.2	13,859
Balsam poplar.....	14,223	7.2	12,710	8.1	1,518	3.6	683
White birch.....	18,326	9.2	15,602	9.9	2,724	6.5	1,226
Bur oak.....	13,015	6.5	9,799	6.2	3,216	7.6	1,443
White elm.....	3,572	1.8	1,945	1.2	1,627	3.9	732
Manitoba maple.....	268	0.1	268	0.2	-----	-----	-----
Green ash.....	14,018	7.1	11,840	7.6	2,178	5.2	980
TOTAL HARDWOOD.....	198,969	100.0	156,908	100.0	42,061	100.0	18,928
WHOLE SOUTHWESTERN FOREST SECTION							
White spruce.....	38,356	14.3	17,420	8.6	20,936	31.7	9,421
Black spruce.....	1,972	0.7	1,425	0.7	547	0.8	246
Tamarack.....	1,011	0.4	788	0.4	223	0.3	101
TOTAL SOFTWOOD.....	41,339	15.4	19,633	9.7	21,706	32.8	9,768
Aspen poplar.....	155,424	58.0	122,874	61.0	32,550	49.2	14,648
Balsam poplar.....	16,523	6.2	14,807	7.3	1,716	2.6	772
White birch.....	19,194	7.2	16,350	8.1	2,844	4.3	1,230
Bur oak.....	17,239	6.4	13,711	6.8	3,553	5.4	1,601
White elm.....	3,617	1.4	1,990	1.0	1,627	2.4	732
Manitoba maple.....	239	0.1	239	0.2	-----	-----	-----
Green ash.....	14,100	5.3	11,922	5.9	2,178	3.3	980
TOTAL HARDWOOD.....	226,416	84.6	181,943	90.3	44,473	67.2	20,013
TOTAL ALL SPECIES.....	267,755	100.0	201,576	100.0	66,179	100.0	29,781

\*One cunit equals 100 cubic feet of wood; one cord equals 85 cubic feet of wood.

†Saw-timber figures were obtained by converting the cubic foot volume of the size class 10" D.B.H. and over to board feet on the assumption that one cubic foot is equal to 4.5 board feet.

# MERCHANTABLE VOLUME BY SPECIES

## SPRUCE WOODS AREA

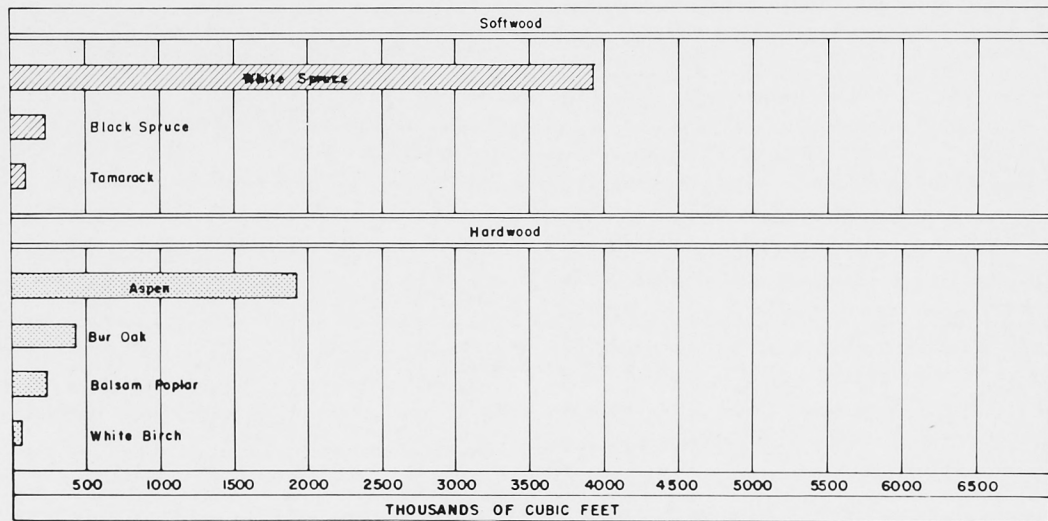


Figure 4.

Table 6

## Land Classification—Uncruised Accessible Areas

Subdivision	Productive Forest			Potentially Productive Forest <i>acres</i>	Nonproductive Forest <i>acres</i>	Permanently Nonforested Land <i>acres</i>	TOTAL LAND <i>acres</i>
	Unmerchantable <i>acres</i>	Merchantable <i>acres</i>	SUBTOTAL <i>acres</i>				
AGRICULTURAL ZONE							
Provincial Crown.....	487,204	177,856	665,060	1,217,178	230,498	255,170	2,367,906
Indian Reserve.....	11,789	4,831	16,620	31,529	2,175	108,415	158,739
Patented.....	1,134,540	465,169	1,599,709	2,908,830	.....	14,038,624	18,547,163
SUBTOTAL.....	1,633,533	647,856	2,281,389	4,157,537	232,673	14,402,209	21,073,808
FOREST ZONE							
Indian Reserve.....	73,930	77,256	151,186	11,482	61,277	56,756	280,701
SUBTOTAL.....	73,930	77,256	151,186	11,482	61,277	56,756	280,701
SUMMARY OF UNCROISED ACCESSIBLE AREAS							
Provincial Crown.....	487,204	177,856	665,060	1,217,178	230,498	255,170	2,367,906
Indian Reserves.....	85,719	82,087	167,806	43,011	63,452	165,171	439,440
Patented.....	1,134,540	465,169	1,599,709	2,908,830	.....	14,038,624	18,547,163
TOTAL.....	1,707,463	725,112	2,432,575	4,169,019	293,950	14,458,965	21,354,509

Indian villages on the Missouri, la Verendrye's journal mentions "the second mountain," Turtle Mountain, the Pembina Hills being the first mountain.

It was not long after the end of French rule in Canada before British traders from Montreal took over la Verendrye's territory. In 1768, Forrest Oakes and his partner, Chas. Boyer, built Pine Fort on the Assiniboine River, near the mouth of Epinette Creek which flows from the sand hills of what later became the Spruce Woods Forest Reserve.<sup>8</sup>

In later years, the junction of the Souris and Assiniboine rivers became an important focal point for the rival fur companies—Hudson's Bay, N.W. Co., "XY," and "Southmen." It was from this point that the Northwestern, David Thompson, in the winter of 1797-98 commenced his trip to the Missouri River, and while enroute was glad to take shelter from a blizzard in the woods of the Turtle Mountain.

The posts on the Assiniboine at its junction with the Souris, and further upstream at the mouth of the

Qu'Appelle, developed into important pemmican supply posts. The buffalo of the plains supplied the dried meat and fat, which was packed in hide bags and transported to such points as Fort Alexander, at the mouth of the Winnipeg River, or Norway House, at the north end of Lake Winnipeg, where it could be transferred to the fur brigades, to be used enroute, or at the northern fur-trading posts.

### *Development of the Area*

The isolated Red River settlement, initiated in 1812, driven out by the jealous Northwest Company in 1816, and flooded out in 1826, became stabilized after that date, but was still dependent on the Hudson's Bay Company in the sale of agricultural products, and for the importation of other than home grown and home made materials and supplies.

Even before Rupertsland had been surrendered by the Hudson's Bay Company in 1870, the Government of Canada, as well as the Imperial Government, had sent out exploring parties to investi-



*Hereford cattle grazing—Spruce Woods Forest Reserve.*

—C. C. Crich, Carberry



Table 7

*Area Classification of Productive Forest by Tenure, Cover Type, and Merchantability  
Uncruised Accessible Areas*

Subdivision	COVER TYPES IN ACRES											
	Softwood			Mixedwood			Hardwood			TOTAL		
	Unmerch.	Merch.	SUBTOTAL	Unmerch.	Merch.	SUBTOTAL	Unmerch.	Merch.	SUBTOTAL	Unmerch.	Merch.	TOTAL
AGRICULTURAL ZONE												
Provincial Crown	93,923	19,972	113,895	123,708	36,392	160,100	269,573	121,492	391,065	487,204	177,856	665,060
Indian Reserves	2,250	563	2,813	2,988	994	3,982	6,551	3,274	9,825	11,789	4,831	16,620
Patented	218,705	52,226	270,931	288,114	95,151	383,265	627,721	317,792	945,513	1,134,540	465,169	1,599,709
SUBTOTAL	314,878	72,761	387,639	414,810	132,537	547,347	903,845	442,558	1,346,403	1,633,533	647,856	2,281,389
FOREST ZONE												
Indian Reserves	44,358	46,354	90,712	22,179	23,177	45,356	7,393	7,725	15,118	73,930	77,256	151,186
SUBTOTAL	44,358	46,354	90,712	22,179	23,177	45,356	7,393	7,725	15,118	73,930	77,256	151,186
SUMMARY OF UNCROISED ACCESSIBLE AREAS												
Provincial Crown	93,923	19,972	113,895	123,708	36,392	160,100	269,573	121,492	391,065	487,204	177,856	665,060
Indian Reserves	46,608	46,917	93,525	25,167	24,171	49,338	13,944	10,999	24,943	85,719	82,087	167,806
Patented	218,705	52,226	270,931	288,114	95,151	383,265	627,721	317,792	945,513	1,134,540	465,169	1,599,709
TOTAL	359,236	119,115	478,351	436,989	155,714	592,703	911,238	450,233	1,361,521	1,707,463	725,112	2,432,575

gate the natural resources of the region west of the Red River. These expeditions made it clear that much of the country was fertile and suitable for agriculture, consequently when Canada came into possession the stage was set for a large scale expansion of settlement westward.

Although Manitoba became a province in 1870, it had at first a very small area, since its western boundary was in the vicinity of Gladstone, while it reached only to Winnipeg Beach in the North and Whitemouth in the east. The western boundary was established in its present location in 1881, and in 1889, after a dispute with Ontario, the present eastern boundary was agreed on.

From the first, the Federal government adopted the policy of retaining control of the natural resources of lands, forests, water resources, and mines, at least until such time as the arable areas had been settled by the free homestead system. Another reason for the retention of Federal control

of land had to do with the necessity of promoting the construction of railway lines through Manitoba and beyond into the western territories, and to the Pacific—these rail lines to be assisted by land grants.

Using the fur traders' and buffalo hunters' trails settlement spread rapidly throughout the Red River valley, the Southwestern Plains, and the Aspen Grove Belt, even before railways were built. The Canadian Pacific main line reached Brandon in 1881, and to this point wheat was hauled by sleigh or wagon, and by ox or horse power for distances of as much as 70 miles from the north and south.

Branch lines of the Canadian Pacific, and lines chartered by other companies, were soon extended into outlying settlements—a rail line reached Birtle in 1886, and another line was extended to Deloraine in the same year. Before the beginning of the first world war, the present rail network in southern Manitoba had been pretty well completed, and a second transcontinental railway had crossed the province.

## ***Forest Administration***

In the early days of agricultural settlement, the prospective settler had little or no guidance from government agencies as to the suitability of the various areas for farming purposes. In some cases, settlers were tempted to settle in wooded areas with the mistaken idea that woodland soils were more fertile than grassland; in other cases, with the desire to get a paying crop as soon as possible, the settler was led to choose land free of trees but too sandy for permanent cropping.

By 1885 a certain amount of land had been homesteaded in the rugged and wooded Turtle Mountain area, and a considerable number of settlers had tried farming in the sandy but relatively open Spruce Woods area. It soon became obvious that farming in these areas was not profitable and they were closed to settlement and classed as Timber Reserves in 1895.



*Pelican Lake, a popular Southwestern Manitoba resort area.*

In 1906 the areas came under the control of the Dominion Forestry Branch as Forest Reserves. Following this date, all private lands within the reserves were acquired by the Crown, administrative headquarters were built, roads, fire-guards, lookout towers, and telephone lines were constructed, and a permanent forest ranger staff was employed.

At the present time Senior Forest Rangers, stationed at Carberry and at Lake Max, south of Boissevain, are in charge of the Spruce Woods and Turtle Mountain forest reserves, respectively. These officers are assisted in the summer months by a number of fire rangers and lookout tower observers, who are employed on construction projects, along with additional men when fire danger is not too high.

The Spruce Woods has four lookout towers, all connected together and to the main headquarters by telephone. One of the special features of fire protection in this forest reserve is the great extent of plowed fire-guard, there being a total of about 200 miles to be maintained each year.

The Turtle Mountain has an 80-foot steel lookout tower at Lake Max, and arrangements have been made for co-operation in fire location between this tower and a tower operated by the State of North Dakota, south of the International Boundary.

A part of the Spruce Woods Forest Reserve is leased to the Department of National Defence as the Camp Shilo military training area, and the military authorities are responsible for fire protection in the leased area. In the fall of 1959, most of the East Block of the Turtle Mountain was withdrawn from the forest reserve for use as a Community Pasture.

The Agricultural Zone of Manitoba includes a considerable area of provincial Crown lands and School lands, about 665,000 acres of which is in productive forest, see Table 6. The forested lands in this zone are mainly confined to a fringe along the northern edge of settlement, but there are scattered parcels of forest land around the outskirts of the Riding, Duck, and Porcupine mountains, west of the Sandilands and Agassiz forest reserves, and on the steep slopes of the Pembina, Souris, and upper Assiniboine rivers. Supervision of timber cutting on these lands is the responsibility of the various

# MERCHANTABLE VOLUME BY SPECIES

## TURTLE MOUNTAIN AREA

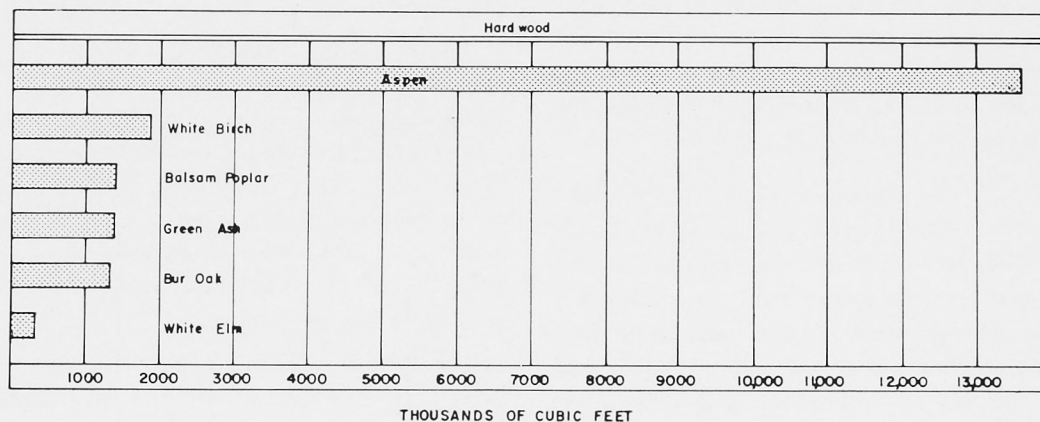


Figure 5.

Table 8

## Softwood and Hardwood Volume by Tenure and Size Classes Uncruised Accessible Areas

Subdivision	*VOLUME IN CUNITS (100 cu. ft. Units)								
	Softwood			Hardwood			TOTAL		
	4'' - 9'' D.B.H.	10'' + D.B.H.	TOTAL	4'' - 9'' D.B.H.	10'' + D.B.H.	TOTAL	4'' - 9'' D.B.H.	10'' + D.B.H.	TOTAL
AGRICULTURAL ZONE									
Provincial Crown.....	183,249	121,899	305,148	553,715	208,273	761,988	736,964	330,172	1,067,136
Indian Reserves.....	4,374	1,992	6,366	15,031	7,589	22,620	19,405	9,581	28,986
Patented.....	548,215	249,769	797,984	1,324,312	668,718	1,993,030	1,872,527	918,487	2,791,014
SUBTOTAL.....	735,838	373,660	1,109,498	1,893,058	884,580	2,777,638	2,628,896	1,258,240	3,887,136
FOREST ZONE									
Indian Reserves.....	352,158	68,242	420,400	91,417	38,523	129,940	443,575	106,765	550,340
SUBTOTAL.....	352,158	68,242	420,400	91,417	38,523	129,940	443,575	106,765	550,340
SUMMARY OF UNCROISED ACCESSIBLE AREAS									
Provincial Crown.....	183,249	121,899	305,148	553,715	208,273	761,988	736,964	330,172	1,067,136
Indian Reserves.....	356,532	70,234	426,766	106,448	46,112	152,560	462,980	116,346	579,326
Patented.....	548,215	249,769	797,984	1,324,312	668,718	1,993,030	1,872,527	918,487	2,791,014
TOTAL.....	1,087,996	441,902	1,529,898	1,984,475	923,103	2,907,578	3,072,471	1,365,005	4,437,476

\*Net roundwood volume: stump height 1', top diameter 3''.



forest rangers in the vicinity, whose main duty is in connection with the forests of the Forest Zone proper, see Map No. 1.

### ***Forest Inventory***

Most of the area now included within the Spruce Woods was subdivided into sections in the years 1874-80 along with the agricultural areas in the vicinity. The land survey of the Turtle Mountain area was completed in 1879 and 1880. By the time of the forest inventory field survey in the summer of 1953, these lines had been pretty well obliterated by prairie and forest fires and by new growth. However, the exterior boundaries of the Spruce Woods had been resurveyed and marked with cement monuments in the 1930s, and on the Turtle Mountain some of the boundaries had been kept cleared as trails by the Forest Service, and, of course, the south boundary being the International boundary was specifically marked.

The Turtle Mountain Forest Reserve was photographed vertically at a scale of 1:15,840 in the summer of 1947, and the Spruce Woods area at the same scale in the following summer.

Base maps were prepared for the provincial forest inventory from the photographs by the provincial Surveys Branch using the slotted template method. Although the interior survey lines were not visible on the photographs, by use of the visible boundaries and by projection of lines from the adjoining settled areas, little difficulty was experienced in getting sufficient ground control to make accurate maps.

The forestry field survey on the two areas was carried out by a four-man party in the summer of 1953. The Spruce Woods and Turtle Mountain forest reserves have quite a different forest composition than is found further north in the mixed wood and coniferous forest, and, as it happens, the two reserves differ greatly from one another. For the special conditions found in these two areas it was thought best to use continuous strips rather than linear plots, and, consequently, strips one-quarter chain wide were run at two-mile intervals, and in a north and south direction.

In the Spruce Woods, due to the intricate mixture of forest and grassland, much of the area had to be typed as Spruce-Aspen-Park, and smaller

areas as Aspen-Park. The other productive forest types were described as Aspen, Black Spruce-Tamarack, and Coniferous Plantation. The productive forest in the Turtle Mountain was divided into Aspen-Good and Aspen-Poor, referring mainly to density, a third and minor type being Coniferous Plantation. Most of the stands in the two reserves are uneven-aged and it was, therefore, not possible to map by age classes.

All trees located on the strips, which were in the 4-inch diameter at breast height class, or larger, were tallied by species. A record of small growth was obtained on the last 2 chains in each 40 chains, and at each 40 chains the nearest tree of each species was recorded as to height and diameter. Form class measurements were made from wind-falls, trees being logged, and from specially felled trees. Local volume tables were prepared based on the Form Class Volume tables of the Federal Forest Service, and (for the hardwoods) from University of Minnesota tables. The stand per acre volume by species (4" D.B.H. and over) was calculated, in cubic feet of wood which when multiplied by the number of acres in the type gave the gross merchantable volume. Types were segregated by townships and again by working circles. From the gross volume, deductions for cull were made by species on a percentage basis as shown in Table 10.

The net volume of wood was divided into two size classes, 4"-9" D.B.H., and 10" D.B.H., and over. Volumes of the larger size class were expressed, first in cubic feet, and again as feet board measure using a converting factor of 4.3 ft.b.m. as equivalent to one cubic foot of wood.

### ***Forest Utilization***

Most of the early settlers built their houses and barns of logs, poplar being commonly used, although oak or spruce was often used when found within hauling distance. For fence posts, poplar and willow were usually available close at hand, and, in some areas, oak; but tamarack and cedar were the choice species and were hauled long distances. Portable sawmills were soon established to produce boards, planks, and scantling for frame buildings, but much pine lumber was brought in from the east as soon as railways made this pos-

sible. Pine from the east was later replaced by Douglas fir, spruce and cedar from British Columbia.

In volume and probably also in value, fuelwood is probably the most important forest product of the Agricultural Zone of Manitoba. Federal census figures show a cut of 497,000 cords from Manitoba farms for the peak year 1935. Since that time the fuelwood cut from farms has decreased through the use of coal, oil, gas, and electricity. The latest figure, (1950), shows a fuelwood cut of 279,000 cords.

The average annual production from the Spruce Woods and Turtle Mountain forest reserves for the last five years is shown in Table 11.

White spruce on the Spruce Woods is cut on a silvicultural system, that is, the trees are cut when large enough to make good sawlogs. Since regeneration occurs on the shaded side of mother trees and bluffs of trees, and as all ages are found, there is very little danger of overcutting. Tamarack is possibly being cut at a faster rate than growth at the present time, but this can be justified by the ever present danger of loss from a larch sawfly epi-

demic, and the advisability of getting a better age class distribution.

On the Turtle Mountain, with present markets, aspen poplar cannot be cut fast enough to equal annual growth. In 1937-38 the cut reached a peak of 4,000 cords, but since then the cut has decreased to an average for the last five years of only 244 cords, due mainly to the use of substitute fuels. The development of a new industry in the district capable of using poplar in the form of pulpwood or chipped wood seems to be necessary if the full annual growth is to be utilized. Another possibility lies in the conversion of the rather poor aspen forest to white spruce which can always find a market.

In addition to the production of timber, the Spruce Woods and Turtle Mountain forest reserves are of considerable importance as grazing areas for cattle and for the production of hay. During recent years the Spruce Woods has grazed over 500 head of cattle annually and produced about 300 tons of hay per year. The Turtle Mountain has led all Manitoba forest reserves as a grazing area, averaging about 1,000 head per year. The production of hay in the Turtle Mountain varies greatly from



*Planting machine in action—Spruce Woods Forest Reserve.*

**Table 9** *Volume by Species and Size Classes—Uncrushed Accessible Areas*

Species	CUNITS BY DIAMETER CLASSES						SAW TIMBER 10'' and Over
	TOTAL		4'' - 9'' D.B.H.		10'' and Over D.B.H.		
	<i>volume</i>	<i>per cent</i>	<i>volume</i>	<i>per cent</i>	<i>volume</i>	<i>per cent</i>	<i>M. ft. b.m.</i>
AGRICULTURAL ZONE—PROVINCIAL CROWN							
White spruce.....	253,273	23.7	136,261	18.5	117,012	35.4	52,655
Black spruce.....	28,989	2.7	27,279	3.7	1,710	0.5	770
Balsam fir.....	6,103	0.6	5,212	0.7	891	0.3	401
Jack pine.....	15,257	1.4	13,014	1.8	2,243	0.7	1,009
Tamarack.....	1,523	0.2	1,483	0.2	43	.....	19
TOTAL SOFTWOOD.....	305,148	28.6	183,249	24.9	121,899	36.9	54,854
Aspen poplar.....	518,914	48.6	372,061	50.5	146,853	44.5	66,084
Balsam poplar.....	70,103	6.6	47,600	6.5	22,503	6.8	10,126
White birch.....	54,863	5.2	40,653	5.5	14,210	4.3	6,395
Bur oak.....	49,529	4.6	39,326	5.3	10,203	3.1	4,591
White elm.....	13,716	1.3	7,544	1.0	6,172	1.9	2,777
Manitoba maple.....	762	.....	762	0.1	.....	.....	.....
Green ash.....	54,101	5.1	45,769	6.2	8,332	2.5	3,750
TOTAL HARDWOOD.....	761,988	71.4	553,715	75.1	208,273	63.1	93,723
TOTAL ALL SPECIES.....	1,067,136	100.0	736,964	100.0	330,172	100.0	148,577
AGRICULTURAL ZONE—INDIAN RESERVES							
White spruce.....	5,284	18.2	3,403	17.5	1,881	19.7	846
Black spruce.....	605	2.1	564	2.9	41	0.4	18
Balsam fir.....	127	0.4	116	0.6	11	0.1	5
Jack pine.....	318	1.1	260	1.3	58	0.6	26
Tamarack.....	32	0.1	31	0.2	1	.....	1
TOTAL SOFTWOOD.....	6,366	21.9	4,374	22.5	1,992	20.8	896
Aspen poplar.....	15,404	53.1	9,859	50.8	5,545	57.9	2,495
Balsam poplar.....	2,081	7.2	1,386	7.2	695	7.2	313
White birch.....	1,629	5.6	1,013	5.2	616	6.4	277
Bur oak.....	1,470	5.1	1,167	6.0	303	3.2	137
White elm.....	407	1.4	224	1.2	183	1.9	82
Manitoba maple.....	23	0.1	23	0.1	.....	.....	.....
Green ash.....	1,606	5.6	1,359	7.0	247	2.6	111
TOTAL HARDWOOD.....	22,620	78.1	15,031	77.5	7,589	79.2	3,415
TOTAL ALL SPECIES.....	28,986	100.0	19,405	100.0	9,581	100.0	4,311
AGRICULTURAL ZONE—PATENTED							
White spruce.....	662,327	23.7	426,539	22.8	235,788	25.7	106,104
Black spruce.....	75,808	2.7	70,653	3.8	5,155	0.6	2,320
Balsam fir.....	15,960	0.6	14,540	0.8	1,420	0.1	639
Jack pine.....	39,899	1.4	32,637	1.7	7,262	0.8	3,268
Tamarack.....	3,990	0.2	3,846	0.2	144	.....	65
TOTAL SOFTWOOD.....	797,984	28.6	548,215	29.3	249,769	27.2	112,396
Aspen poplar.....	1,357,253	48.6	868,642	46.4	488,611	53.2	219,875
Balsam poplar.....	183,359	6.6	122,117	6.5	61,242	6.7	27,559
White birch.....	143,498	5.2	89,256	4.8	54,242	5.9	24,409
Bur oak.....	129,547	4.6	102,860	5.5	26,687	2.9	12,009
White elm.....	35,875	1.3	19,731	1.0	16,144	1.7	7,265
Manitoba maple.....	1,993	.....	1,993	0.1	.....	.....	.....
Green ash.....	141,505	5.1	119,713	6.4	21,792	2.4	9,806
TOTAL HARDWOOD.....	1,993,030	71.4	1,324,312	70.7	668,718	72.8	300,923
TOTAL ALL SPECIES.....	2,791,014	100.0	1,872,527	100.0	918,487	100.0	413,319



year to year with the water levels in the lakes and marshes, but the production in favourable years has been as high as 1,000 tons.

The unique scenery of the rolling sandhill country in and around the Spruce Woods Forest Reserve has an appeal to all who travel through the area. Ernest Thompson Seton, who spent some of his early years—to use his own words, “among the endless groves and glades of the Sandhill wilderness about Carberry” was stimulated here to write his first book “The Trail of the Sandhill Stag”. A number of roadside picnic sites have recently been established at picturesque locations in the area for the convenience of those who have time to stop and enjoy the country.

The Turtle Mountain area has summer resort developments on Max Lake and Metigoshe Lake in Manitoba and on Metigoshe Lake in North Dakota. Lake William also has a considerable potential as a resort area, its waters being well stocked with rainbow trout. A focal point for the whole area is the International Peace Garden located astride the International Boundary on Highways No. 3 (North Dakota) and No. 10 (Manitoba). This unique park with its undulating tree-clad hills, grassy glades, and gem-like lakes, and, in contrast, its formal terrace panel extending along the boundary of the two countries, is suitably located close to the centre of the North American continent.

The Spruce Woods and the Turtle Mountain Game Preserves occupy a part of the respective forest reserves of the same name. The only moose in Southwestern Manitoba are found in the Sewell Lake area of the Spruce Woods. A small herd of elk are located in the Spruce Woods and white tail deer are plentiful in both areas. In the past few years, beaver, muskrat, weasel, and squirrel have been trapped under special permit. Ducks and geese are found in the lakes during the migration period. Sharp-tail and ruffed grouse are common throughout the area.

Many of the shallow lakes in the Turtle Mountain, and elsewhere in Southwestern Manitoba, offer opportunities for sports fishing. The larger lakes, such as Killarney, Rock, Pelican, etc., provide excellent angling for northern pike and pickerel (walleye).

## Reforestation

The natural spruce forest in the Spruce Woods area seems to be quite capable of maintaining itself, given the fire protection which it has received, but the advance of the forest onto the grassland is very slow, or, perhaps, in balance, and, consequently, planting has been resorted to. Early experiments with planting white spruce were discouraging, although some successful spruce plantations have been established in later years. Scots pine and jack pine plantations, on the other hand, have been successfully established.

A survey of older plantations made in 1952<sup>9</sup> showed that Scots pine plantations originating in 1916 had up to 2,454 cubic feet of wood per acre, with a mean annual increment of 62.9 cu. ft. per acre. Jack pine plantations of the same year had volumes up to 2,238 cubic feet, and mean annual increment of 53.3 cu. ft. per acre. This survey and an examination of younger plantations made in 1956,<sup>10</sup> indicated that jack pine plantations of good tree form could be successfully established, but that Scots pine plantations had poorer tree form and were more subject to insect attack and climatic damage. White spruce plantations set out from 1943 onward appeared to be quite promising. Experiments with lodgepole pine and ponderosa pine indicate that these species are not suited to the region.

Although the Turtle Mountain has no native conifers, judging by the success of a number of white spruce plantations, the region is very well

**Table 10**

*Cull Factor by Species—Southwestern Forest Section*

Species	DEDUCTION FOR CULL IN PER CENT	
	SPRUCE WOODS	TURTLE MOUNTAIN
White spruce.....	10	....
Black spruce.....	5	....
Tamarack.....	10	....
Aspen poplar.....	20	40
Balsam poplar.....	20	40
White birch.....	20	40
Bur oak.....	20	40
White elm.....	20	40
Manitoba maple.....	20	40
Green ash.....	20	40

suited to the healthy growth of this species. A plantation set out in 1912, on being measured in 1958 was found to have a wood volume of 2,596 merchantable cubic feet per acre, despite the fact that the trees were planted with a rather wide spacing (4 ft. by 8 ft.), and that half of the trees were killed by rabbits in the first few years after planting.<sup>11</sup>

Planting was started in the Spruce Woods in 1905, and in the Turtle Mountain in 1912. Table No. 12 shows the number of trees planted, by species, for the two forest areas, up to and including the year 1959.

### ***Farm Forestry and Tree Culture Projects<sup>3</sup>***

Planting on private lands in Manitoba has been mainly confined to the establishment of farmstead shelterbelts around farm buildings and gardens, although in later years much interest has been shown in field shelterbelt planting as a soil drifting preventive. Much of the planting stock has come from the Dominion Department of Agriculture

**Table 11**

*Utilization of Forest Products, Average Annual Production for 5-Year period 1954-55 to 1958-59*

*Spruce Woods and Turtle Mountain Forest Reserves*

Product	SPRUCE WOODS	TURTLE MOUNTAIN	TOTAL
LUMBER, <i>ft. b.m.</i> .....	98,000	48,000	146,000
Spruce.....	94,000	.....	94,000
Poplar.....	4,000	48,000	52,000
PULPWOOD, <i>cords</i> .....	11	.....	11
Spruce.....	11	.....	11
FENCE POSTS, <i>pieces</i> .....	11,612	13,517	25,129
Tamarack.....	10,772	.....	10,772
Willow.....	.....	1,240	1,240
Oak.....	580	11,471	12,051
Ash.....	260	806	1,066
FUELWOOD, <i>cords</i> .....	367	307	674
Spruce.....	12	.....	12
Jack pine.....	2	.....	2
Poplar.....	88	244	332
Other hardwoods.....	1	1	2
Dry wood.....	226	62	288
Slabs and tops.....	38	.....	38
ROUND TIMBER, <i>lin. ft.</i> .....	40,000	1,000	41,000
CHRISTMAS TREES, <i>No. of trees</i> .....	613	.....	613

**Table 12**

*Number of Trees Planted on Crown Lands in Spruce Woods and Turtle Mountain Areas*

Species	SPRUCE WOODS	TURTLE MOUNTAIN	TOTAL
White spruce.....	313,000	325,000	638,000
Jack pine.....	3,662,000	.....	3,662,000
Lodgepole pine.....	425,000	.....	425,000
Red pine.....	61,000	.....	61,000
Scots pine.....	2,293,000	8,000	2,301,000
Miscellaneous conifers.....	5,000	1,000	6,000
TOTAL.....	6,759,000	334,000	7,093,000

Forest Nursery stations at Indian Head and Sutherland, Saskatchewan, although private nurseries have made an important contribution, especially in supplying ornamental trees and shrubs. In the last few years the provincial Forest Service has supplied coniferous trees for farmstead planting and also for woodlots.

During the last 7 years 2,062 miles of single row field shelterbelts have been planted on Manitoba farms with the assistance and advice of the provincial Department of Agriculture, and local municipalities.

Woodlot planting has been mainly concerned with the production of Christmas trees, Scots pine being the preferred species.

## ***Appendix***

### **ROTATION**

The length of the rotation for the various species depends on the site, the product to be cut, and, to a lesser extent, the climatic region. Table 13 gives tentative figures for the productive forest area of Manitoba. A range of rotation age is given depending mainly on whether the stand is to be cut for pulpwood or saw-timber.

**Table 13**

*Rotation by Species*

Species	years
White spruce.....	80 - 120
Black spruce.....	80 - 140
Balsam fir.....	60 - 80
Jack pine.....	60 - 90
Tamarack.....	70 - 100
Cedar.....	100 - 200
Aspen poplar.....	50 - 70
Balsam poplar.....	50 - 70
White birch.....	60 - 80

## ALLOWABLE CUT

A determination of the allowable annual depletion by cutting, fire, etc., is necessary in order that the forest may be kept on a sustained yield basis. The compiled inventory data presents volume by cover-type, age class, and species while area is presented by age class and cover-type only. The method of calculation most suitable to the available data is by a volumetric formula.

The simplest formula for finding the annual yield, commonly known as the Von Mantel formula, is as follows:

$$\text{Annual Yield} = \frac{\text{Growing Stock}}{\text{Half the number of years in rotation}}$$

For general inventory purposes this formula has been used as the basis for calculation of the allowable cut by Working Circles, each species being calculated separately according to its average rotation age. A deduction of 20 per cent has been made to allow for contingencies such as loss from fire, windfall, insects, and disease.

In those areas which have established Working Plans such as the Southeastern Forest Section, the Duck Mountain Forest Reserve, Pulpwood Berth No. 1, and certain other areas, various alternative methods have been used in arriving at the Allowable Cut. It is usual in these cases to secure a more accurate estimate of the Allowable Cut by methods which take into account any unevenness in age class distribution.

★ ★ ★

### Common and Botanical Names of Tree Species Mentioned in Report

#### CONIFERS

White spruce	— <i>Picea glauca</i> (Moench) Voss
Black Spruce	— <i>Picea mariana</i> (Mill) BSP
Balsam fir	— <i>Abies balsamea</i> (L.) Mill
Jack pine	— <i>Pinus banksiana</i> Lamb.
Lodgepole pine	— <i>Pinus contorta</i> Dougl.
Red pine	— <i>Pinus resinosa</i> Ait
Ponderosa pine	— <i>Pinus ponderosa</i> Laws.
Scots pine	— <i>Pinus sylvestris</i> L.
Tamarack	— <i>Larix laricina</i> (Du Roi) K. Koch
Cedar	— <i>Thuja occidentalis</i> L.

## HARDWOODS

Aspen poplar	— <i>Populus tremuloides</i> Michx.
Balsam poplar	— <i>Populus balsamifera</i> L.
Cottonwood	— <i>Populus deltoides</i> Marsh
White birch	— <i>Betula papyrifera</i> Marsh
Bur oak	— <i>Quercus macrocarpa</i> Michx.
White elm	— <i>Ulmus americana</i> L.
Manitoba maple	— <i>Acer negundo</i> L.
Basswood	— <i>Tilia americana</i> L.
Green ash	— <i>Fraxinus pennsylvanica</i> Marsh

## References

1. Mesozoic Stratigraphy of the Eastern Plains, Manitoba and Saskatchewan, by R. T. D. Wickenden, Memoir 239, Geological Survey, Canada Department of Mines and Resources, 1945.
2. Guide Book, Pleistocene Geology of Southwestern Manitoba, by J. A. Elson, Geological Survey of Canada, Department of Mines and Technical Surveys, 1954.
3. Farm Forestry and Tree Culture Projects, by J. H. Ellis, C. B. Gill, and F. W. Brodrick, a report prepared for the Post-war Reconstruction Committee of the Government of Manitoba, 1945.
4. The Soils of Manitoba, by J. H. Ellis, published by Economic Survey Board, Province of Manitoba, 1938.
5. Flora of Manitoba, by H. J. Scoggan, Bulletin 140, National Museum of Canada, Department of Northern Affairs and National Resources, 1957.
6. Reports of Reconnaissance Soil Survey Nos. 3 and 4 by Manitoba Soil Surveys, 1940 and 1943.
7. Forest Regions of Canada, by J. S. Rowe, Bulletin 123, Forestry Branch, Department of Northern Affairs and National Resources, 1959.
8. A History of the Canadian West, by Arthur S. Morton, 1939.
9. Planting of Conifers in the Spruce Woods Forest Reserve, Manitoba, 1904-1929, by J. S. Jameson, Technical Note No. 28, Forest Research Division, Department of Northern Affairs and National Resources, 1956.
10. Spruce Woods Plantations, 1930-1946, unpublished report by R. A. Haig, Forest Research Division, Department of Northern Affairs and National Resources, 1957.
11. Reforestation by Planting, Turtle Mountain Forest Reserve, Manitoba, unpublished report by R. A. Haig, Forest Research Division, Department of Northern Affairs and National Resources, 1959.



## DATE DUE SLIP

### ALLOWABLE

A determination of the  
tion by cutting, fire, etc., is  
the forest may be kept on  
The compiled inventory d  
cover-type, age class, and s  
sented by age class and  
method of calculation most  
data is by a volumetric form

The simplest formula for  
commonly known as the V  
follows:

$$\text{Annual Yield} = \frac{\text{Gross Annual Yield}}{\text{Half the number of years in rotation}}$$

For general inventory pu  
been used as the basis for c  
able cut by Working Circle  
calculated separately accord  
tion age. A deduction of 20  
to allow for contingencies  
windfall, insects, and diseas

In those areas which hav  
Plans such as the Southeast  
Duck Mountain Forest Res  
No. 1, and certain other ar  
methods have been used in  
able Cut. It is usual in these  
accurate estimate of the Allo  
which take into account a  
class distribution.

★ ★ ★

### Common and Botanical Names of Tree Species Mentioned in Report

#### CONIFERS

White spruce	— <i>Picea glauca</i> (Moench) Voss
Black Spruce	— <i>Picea mariana</i> (Mill) BSP
Balsam fir	— <i>Abies balsamea</i> (L.) Mill
Jack pine	— <i>Pinus banksiana</i> Lamb.
Lodgepole pine	— <i>Pinus contorta</i> Dougl.
Red pine	— <i>Pinus resinosa</i> Ait
Ponderosa pine	— <i>Pinus ponderosa</i> Laws.
Scots pine	— <i>Pinus sylvestris</i> L.
Tamarack	— <i>Larix laricina</i> (Du Roi) K. Koch
Cedar	— <i>Thuja occidentalis</i> L.

### ARDWOODS

*pulus tremuloides* Michx.  
*pulus balsamifera* L.  
*pulus deltoides* Marsh  
*tula papyrifera* Marsh  
*iercus macrocarpa* Michx.  
*mus americana* L.  
*er negundo* L.  
*ia americana* L.  
*axinus pennsylvanica* Marsh

## ferences

raphy of the Eastern Plains,  
skatchewan, by R. T. D. Wick-  
139, Geological Survey, Canada  
ines and Resources, 1945.

otocene Geology of Southwestern  
A. Elson, Geological Survey of  
ent of Mines and Technical Sur-

l Tree Culture Projects, by J. H.  
nd F. W. Brodrick, a report pre-  
t-war Reconstruction Committee  
of Manitoba, 1945.

itoba, by J. H. Ellis, published  
vey Board, Province of Mani-

by H. J. Scoggan, Bulletin 140,  
of Canada, Department of  
nd National Resources, 1957.

6. Reports of Reconnaissance Soil Survey Nos. 3 and 4 by Manitoba Soil Surveys, 1940 and 1943.
7. Forest Regions of Canada, by J. S. Rowe, Bulletin 123, Forestry Branch, Department of Northern Affairs and National Resources, 1959.
8. A History of the Canadian West, by Arthur S. Morton, 1939.
9. Planting of Conifers in the Spruce Woods Forest Reserve, Manitoba, 1904-1929, by J. S. Jameson, Technical Note No. 28, Forest Research Division, Department of Northern Affairs and National Resources, 1956.
10. Spruce Woods Plantations, 1930-1946, unpublished report by R. A. Haig, Forest Research Division, Department of Northern Affairs and National Resources, 1957.
11. Reforestation by Planting, Turtle Mountain Forest Reserve, Manitoba, unpublished report by R. A. Haig, Forest Research Division, Department of Northern Affairs and National Resources, 1959.

SD 146 M3 M27 1956 NO-8  
MANITOBA FORESTRY BRANCH  
FOREST RESOURCES INVENTORY  
1956

39676272 SCI



\*000013776158\*

SD 146 M3 M27 1956 no.8  
Manitoba. Forestry Branch  
Forest resources inventory,  
1956 :

39676272 SCI

MAY 07 1984



**B40059**